Summary of the Control and Monitoring Activities for Smallmouth Bass (*Micropterus dolomieu*) in Miramichi Lake, NB, in 2013 and 2014

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ABSTRACT

A three year eradication program to eliminate Smallmouth Bass (SMB) in Miramichi Lake removed a total of 2,584 SMB in 2010, 523 SMB in 2011 and 46 SMB in 2012 (Biron et al. 2014). The fishing effort using boat electrofishing, gillnetting and fyke-netting more than doubled in 2011 and 2012, compared to 2010, and the catch-per-unit-effort declined by 99% at the end of the 3 year program. The results from the Multi-year Control and Eradication Program were very encouraging since it supported the successful depletion and containment of SMB in Miramichi Lake, but eradication was not achieved as demonstrated by the presence of all the life stages of that species in 2012. Therefore, it was recommended that monitoring and a containment program for SMB in Miramichi Lake be implemented after 2012.

Several fishing methods were used to capture and remove Smallmouth Bass from Miramichi Lake in 2013 and 2014. In addition to operating a containment barrier at the outlet of the lake, gill-netting, fyke-netting, beach seining and opportunistic angling were conducted throughout the season. Boat electrofishing and backpack electrofishing were also conducted during two periods of two weeks each in late spring and mid-summer. Capture data for 2013 and 2014 presented in this data report are considered preliminary. Ages for 2013 and 2014 are based on size alone and will be confirmed at a later date by scale and/or otolith reading. In 2013, there were 507 young-of-the-year (YOY), 2 juveniles and 6 adults captured and eliminated from Miramichi Lake, for a total of 515 SMB. In 2014, there were 555 YOY, 7 juveniles and 3 adults captured and eliminated from Miramichi Lake, for a total of 565 SMB.

RÉSUMÉ

Un programme d'éradication de l'achigan à petite bouche de trois ans dans le lac Miramichi a éliminé un total de 2,584 achigans à petite bouche en 2010, 523 achigans en 2011 et 46 achigans en 2012. L'effort de pêche à l'aide du bateau de pêche électrique, aux filets maillants et aux filets verveux ont plus que doublé en 2011 et 2012, par rapport à 2010, et les captures par unité d'effort ont diminué de 99% par la fin du programme de 3 ans. Les résultats du programme de contrôle et d'éradication étaient très encourageants puisque qu'ils démontrent avec succès l'épuisement et le confinement des achigans à petite bouche dans le lac Miramichi, mais l'éradication n'a pas encore été atteinte comme en témoigne la présence de tous les stades du cycle de vie de cette espèce en 2012. Par conséquent, il a été recommandé qu'un programme de surveillance et de confinement pour les achigans dans le lac Miramichi soit mis en œuvre après 2012.

Plusieurs méthodes de pêche ont été utilisées pour capturer et éliminer les achigans à petite bouche du lac Miramichi en 2013 et 2014. En plus d'exploiter une barrière de confinement à la sortie du lac, la pêche aux filets maillants, aux verveux, à la senne de plage et la pêche à la ligne opportuniste ont été menées tout au long de la saison. La pêche électrique par bateau et avec des unités portatifs a également été menée au cours de deux périodes de deux semaines chacune à la fin du printemps et au milieu de l'été. Les données de capture pour 2013 et 2014 présentées dans ce rapport statistique sont considérées préliminaires. Les âges pour 2013 et 2014 sont basés sur la taille seule et seront confirmés à une date ultérieure par la lecture des écailles et / ou des otolithes. En 2013, il y eu 507 jeunes de l'année, 2 juvéniles et 6 adultes capturés et

éliminés du lac Miramichi, pour un total de 515 achigans. En 2014, il y eu 555 jeunes de l'année, 7 juvéniles et 3 adultes capturés et éliminés du lac Miramichi, pour un total de 565 achigans.

1.0 INTRODUCTION

In August 2008, anglers reported the presence of the non-native Smallmouth Bass (*Micropterus dolomieu*) in Miramichi Lake, which drains into a headwater tributary of the South Branch of the Southwest Miramichi River in New Brunswick. In response to concerns about the potential impact of Smallmouth Bass (SMB) on Atlantic Salmon, a risk assessment of the possible impact of this non-native species introduction in the Miramichi River system was conducted in January 2009 (DFO 2009; Chaput and Caissie 2010). The overall risk to aquatic species in Miramichi Lake was considered to be high with low uncertainty whereas the risk of potential impacts to the ecosystem of the Miramichi River and other rivers of the Gulf Region was judged to be moderate with high uncertainties (DFO 2009). Following on the risk assessment and field investigations of 2009, the Department of Fisheries and Oceans (DFO) in collaboration with the watershed groups and the province of New Brunswick initiated in 2010 a three-year containment, control and eradication program (Biron et al. 2014).

Several fishing methods were used to capture and remove Smallmouth Bass from Miramichi Lake between 2010 and 2012. In addition to operating a containment barrier at the outlet of the lake, boat electrofishing, backpack electrofishing, gill-netting, fyke-netting, beach seining and opportunistic angling were conducted throughout the ice-free season (Biron et al. 2014).

The containment and depletion of the Smallmouth Bass population in Miramichi Lake between 2010 and 2012 was deemed successful as indicated by fishery indicators, but eradication was not achieved as proven by the capture of all the life stages of that species in 2012 (Biron et al. 2014). Therefore, it was recommended that some form of monitoring and control program continue after 2012. The present data report is a summary of the Miramichi Lake activities in 2013 and 2014 (Tables 1 and 2).

2.0 METHODS

Miramichi Lake is located in the headwater of the Southwest Miramichi River basin in New Brunswick. It is approximately 2.8 km in length by 0.8 km in width with an estimated surface area of 2.21 km^2 (221 ha). Relatively shallow, the majority of the lake is less than 3.75 m deep and has two deep holes with maximum depth less than 7.65 m (Figure 1). Miramichi Lake drains into its only outlet, Lake Brook, a 4.5 km tributary of the South Branch of the Southwest Miramichi River. The lake was divided into 16 sectors to facilitate localization on the lake during fishing effort (Figure 1).

The same fishing methods as previous years were used to capture and remove SMB from Miramichi Lake in 2013 and 2014 (Biron et al. 2014). Building and maintaining the two fences composing the barrier, allowing safe passage to fish moving up and down Lake Brook, and controlling SMB from moving out of the lake was the priority of the 'barrier crew'. The barrier crew was also responsible to set and fish gill nets, fyke nets and beach seines throughout the season, as time permitted.

The 'electrofishing crew' was responsible to conduct backpack electrofishing in Lake Brook and along the shore of the lake, as well as boat electrofishing over the entire shallow portion (0 to 2 m depth) of the lake during two periods of two weeks in late-spring and mid-summer. Boat electrofishing was usually conducted at night, while backpack electrofishing occurred during day time.

3.0 MIRAMICHI LAKE ACTIVITIES IN 2013

3.1-Barrier on Outlet (Lake Brook)

The barrier was operational 7 days a week from May 10 to October 29, 2013. Water level remained relatively high all summer in 2013 (compared to 2010 to 2012 seasons) which resulted in keeping the debris fence lined with a larger mesh size net (12mm) to reduce the pressure on it. In past years (2010-2012), a smaller mesh size would have been installed at the end of June on both fences before the appearance of young-of-the-year (YOY), but this was done only on the main barrier in 2013. This may also explain why in 2013, for the first time since 2010, 3 YOY SMB were captured in the enclosure between the two fences.

3.2-Backpack Electrofishing

Lake Brook water level was high (relative to 2010 to 2012) when the first 500m of the brook were backpack electrofished on Wednesday, August 7. No SMB were captured or encountered.

The barrier area (part of Sectors 15 and 16) was backpack electrofished on Tuesday July 30, and the entire shore of Sector 1 on August 1, for the capture of 1 YOY SMB in Sector 1.

3.3-Gill Nets

From mid-June to mid-July, up to 6 gillnets were fished on an irregular basis by the barrier crew. After July 15, minimal gillnet effort was deployed (1 net/day) fished irregularly to concentrate available barrier crew time on beach seining instead. One large adult female (6 or 7 year old based on size) was captured on September 04, 2013 in Sector 16.

3.4-Fyke Nets

Five fyke nets were fished on an irregular basis in Sectors 1 and 16 from the beginning of the 2013 season until mid-July, with only 1 juvenile (1 year old) captured on July 5 in Sector 1. After July 15, 35 YOY SMB were captured with fyke nets, all in Sector 1.

3.5-Boat Electrofishing

During the first survey period by boat electrofishing conducted from May 27 to 31, 2013 (week 22) and from June 3 to 7, 2013 (week 23), the entire Sectors 1 and 16, as well as most of Sector 15 and part of Sector 5 were targeted. A total of 4.5 hours of day time and 14.6 hours of night time of electrofishing effort yielded 4 adult SMB. The 2 male and 2 female adult bass were 3 year old, based on size. Sector 1, 16, and part of 15 are believed to be prime spawning grounds based on the 2010 to 2012 sampling seasons (Biron et al. 2014).

During the second survey period by boat electrofishing conducted from July 29 to August 2, 2013 (week 31) and from August 5 to 9, 2013 (week 32), the entire Sectors 1 and 16, as well as most of Sector 15 and part of Sector 5 were again targeted, with transects that also occurred in Sectors 2, 3, 4 and 6 to verify the absence of SMB outside the targeted areas. A total of 0.3 hour of day time and 15.4 hours of night time electrofishing effort yielded 1 adult (3 years old; Sector 16) and 53 YOY smallmouth bass in Sectors 1 and 16.

3.6-Beach seining

Weather permitting, beach seining was conducted daily beginning July 17 and covered Sectors 1, 3, 4, 5, 6, 7, 13, 14, 15 and 16. YOY SMB were mostly captured in Sectors 1 (n=262) and 16 (n=126), but also in Sectors 3 (n=3), 5 (n=1), 6 (n=2), 7 (n=1), 13 (n=5) and 15 (n=10). Another 5 YOY were identified as being captured in Sectors 15/16. One 2 year old juvenile was also captured in Sector 1 on July 29, 2013.

3.7-Angling

Little angling was conducted in 2013. No SMB were captured by the electrofishing or barrier crews, but there was one unverified report of one adult SMB being captured by a local angler.

4.0 MIRAMICHI LAKE ACTIVITIES IN 2014

4.1-Barrier on Outlet (Lake Brook)

The barrier was operational 7 days a week from May 15 to October 29, 2014. Heavy rain (>100mm) over the weekend of July 5-6, 2014 resulted in an important rise in water level of Miramichi Lake to level above the debris fence. Otherwise, 2014 was a low water level year compared to the continuously high water level of the lake in 2013. No SMB was captured between the two fences in 2014.

4.2-Backpack Electrofishing

Backpack electrofishing activities occurred in the first 400 m of Lake Brook on July 29, where 1 YOY SMB may have been observed but not captured. The shores of Sectors 1 and 16 were backpack electrofished on July 30 with the capture of 1 YOY SMB in Sector 16. Other YOY SMB were observed in both Sectors but not captured. It is believed that water temperature was too warm at 23.5°C for this technique to be efficient at capturing SMB.

4.3-Gill Nets

Gill nets were fished on an irregular daily/weekly basis by the barrier crew from May 19 to September 23, 2014. However, once the first YOY SMB were observed in the lake on July 14, the crew concentrated on the capture of YOY by deploying all available fyke nets, and by conducting daily beach seining whenever possible. To free up time, gillnetting effort was stopped from July 28 to Aug. 13, and greatly reduced afterward. No SMB was captured with gill nets in 2014.

4.4-Fyke Nets

Up to six fyke nets were fished on an irregular daily/weekly basis mainly in Sectors 1 and 16 from May 15 to October 28, 2014 by the barrier crew. On July 14, 8 YOY SMB were captured in fyke nets located in Sector 1. This was the signal for the barrier crew to concentrate on the capture of YOY by deploying all available fyke nets, and by conducting daily beach seining whenever possible. A total of 55 YOY and 4 juveniles SMB were captured in Sectors 1, and 7 YOY in Sector 16.

4.5-Boat Electrofishing

The first survey period by boat electrofishing was conducted from June 2nd to 6, 2014 (week 23) and from June 9 to 13, 2014 (week 24) by targeting primarily Sectors 1, 15

and 16, which are believed to be prime spawning areas, and Sectors 3 to 14 for potential juveniles. A total of 5.3 hours of day time and 12.3 hours of night time of electrofishing effort resulted in the capture of 1 three-year old female SMB on June 12 in Sector 1 (Foster's Cove).

The second survey period by boat electrofishing was conducted from July 28 to August 1, 2014 (week 31) and from August 4 to 8, 2014 (week 32) by targeting Sectors 1, 15 and 16, where YOY had been observed after July 14 and Sectors 2 to 14 to verify if YOY were present outside of targeted area. A total of 0.6 hour of day time and 16.3 hours of night time electrofishing effort yielded 1 adult (3 years old; Sector 16) and 82 YOY. YOY SMB were mostly captured in Sectors 1 and 16 (n=66), but also in Sectors 5 (n=6), 6 (n=6), 12 (n=1), 13 (n=1) and 15 (n=2).

4.6-Beach seining

Following the first capture of YOY SMB with fyke nets on July 14, 2014, the barrier crew conducted beach seining on a daily basis in Sectors 1 and 16, and irregularly in Sectors 2, 3, 4, 5, 6, 7, 12, 13 and 15. YOY SMB were mostly captured in Sectors 1 (n=251) and 16 (n=133), but also in Sectors 2 (n=1), 4 (n=3), 6 (n=2) and 15 (n=21). One 2 year old juvenile was also captured in Sector 16 on August 25, 2014.

4.7-Angling

Limited angling effort with lures and baited lures, directed at habitats favoured by larger SMB, captured no SMB during the summer of 2014. This is consistent with results of angling effort in prior years.

5.0 ACKNOWLEDGEMENTS

Field support in 2013 and 2014 was provided by the Miramichi Watershed Management Committee (Jacob Richard, Omer Richard) and the Miramichi Headwaters Salmon Association (Brian Richard). Chris Connell from the New Brunswick Department of Natural Resources conducted the bathymetry map of Lake Miramichi. Rejean Vienneau (Department of Fisheries and Oceans) provided maintenance, technical support and modifications to the electrofishing boat in 2013 and 2014. Sophie LeBlanc and Claude Légere (Department of Fisheries and Oceans) provided the technical help for backpack and boat electrofishing in 2013, while Renelle Doucette and Wayne Fairchild (Department of Fisheries and Oceans) provided the technical help for backpack and boat electrofishing in 2014.

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Table 1. Catch comparison for young-of-the-year (YOY), juvenile and adult Smallmouth Bass (SMB) for 2010 to 2014, including all methods of capture (electrofishing, gill nets, fyke nets, beach seine, angling, others). Blank cells indicate that no activity occurred during that period; shaded cells indicate time periods when backpack and boat electrofishing was conducted in Miramichi Lake.

	Young of the year (<1 year old)					Juveniles (1 and 2 year old)					Adults (≥3 year old)					Total				
Week	2010	2011	2012	2013	2014	2010	2011	2012	2013	2014	2010	2011	2012	2013	2014	2010	2011	2012	2013	2014
17			0					0					0					0		
18			0					1					0					1		
19			0					0					0					0		
20	0		0	0		0		1	0		0		0	0		0		1	0	
21	0	0	0	0	0	5	0	0	0	0	1	2	0	0	0	6	2	0	0	0
22	0	0	0	0	0	2	1	0	0	1	0	2	0	1	0	2	3	0	1	1
23	0	0	0	0	0	0	0	0	0	0	0	2	0	3	0	0	2	0	3	0
24	0	0	0	0	0	0	1	0	0	1	0	4	0	0	1	0	5	0	0	2
25	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	0
26	0	0	0	0	0	0	0	1	0	0	1	3	0	0	0	1	3	1	0	0
27	0	0	0	0	0	0	0	1	1	1	1	2	0	0	0	1	2	1	1	1
28	0	0	0	0	0	1	0	2	0	0	2	2	1	0	0	3	2	3	0	0
29	21	0	0	21	8	2	0	1	0	0	1	3	1	0	0	24	3	2	21	8
30	35	23	10	161	123	0	0	0	0	0	11	1	0	0	0	46	24	10	161	123
31	103	73	12	68	216	0	1	0	1	0	0	0	0	1	0	103	74	12	70	216
32	80	72	3	97	114	4	1	0	0	2	1	0	1	0	2	85	73	3	97	118
33	206	41	1	19	54	0	0	0	0	1	3	0	0	0	0	209	41	1	19	55
34	394	55	1	12	2	0	0	0	0	0	0	1	0	0	0	394	56	1	12	2
35	138	18	0	29	27	1	0	0	0	1	0	0	0	0	0	139	18	0	29	28
36	507	49	2	16	6	2	0	0	0	0	2	0	0	1	0	511	49	2	17	6
37	283	21	0	14	0	0	1	0	0	0	1	0	0	0	0	284	22	0	14	0
38	231	19	2	4	0	0	1	0	0	0	1	3	0	0	0	232	23	2	4	0
39	151	59	3	0	0	1	4	0	0	0	1	1	0	0	0	153	64	3	0	0
40	127	24	2	45	0	2	0	0	0	0	1	1	0	0	0	130	25	2	45	0
41	101	5	0	20	0	1	0	0	0	0	1	0	0	0	0	103	5	0	20	0
42	112	19	0	1	5	0	0	0	0	0	3	1	0	0	0	115	20	0	1	5
43	43	5	0	0	0	0	0	0	0	0	0	0	0	0	0	43	5	0	0	0
44		0		0	0		0		0	0		0		0	0		0		0	0
Total	2532	483	36	507	555	21	10	7	2	7	31	30	3	6	3	2584	523	46	515	565

Table 2. Smallmouth Bass catch in numbers by fishing methods for 2013 and 2014 (YOY = young-of-the-year).

	2013			2014		
Fishing methods	YOY	Juveniles	Adults	YOY	Juveniles	Adults
Beach seine	415	1		411	1	
Electrofishing	54		5	82	2	3
Fyke net	35	1		62	4	
Gill net			1			
barrier	3					

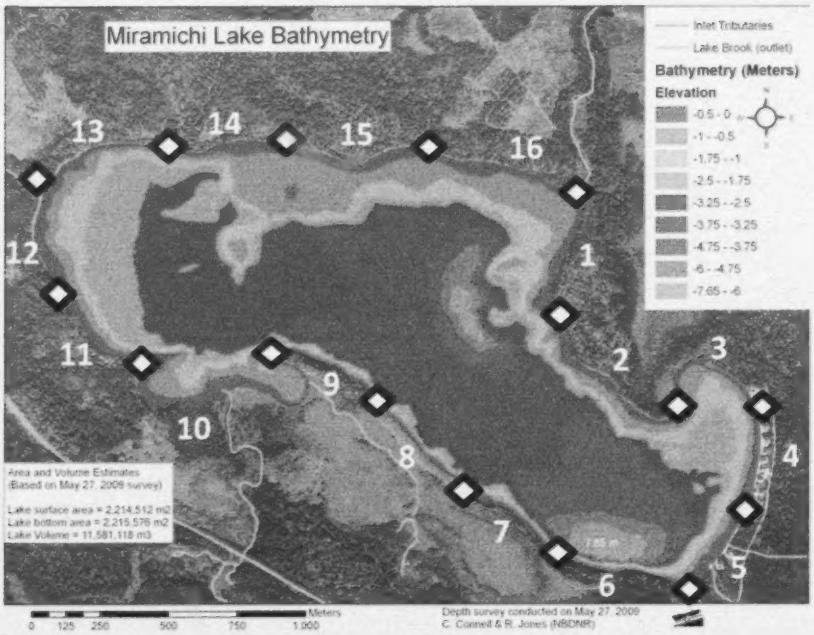

Figure 1. Bathymetry of Miramichi Lake and location of sectors and sector boundaries. Bathymetric data and profiles were provided by C. Connell and R. Jones, New Brunswick Department of Natural Resources.